NAIP 2004

Idaho, Louisiana, Texas

Leica ADS40

Introduction

- Nebraska 2003 NAIP was the first statewide project completed with the ADS40
  - Results were very favorable
  - Some problems were encountered with the Leica production process
- Nebraska was followed by a statewide Florida contract in 2004 to produce color and false-color 1m ortho for the entire state
  - Results also very favorable
- In 2004 an even larger program for the USDA-FSA NAIP program was undertaken:
  - Statewide Idaho and Texas, and a portion of Louisiana

Project descriptions:

- Texas:
  - Complete statewide coverage
  - 17,564 DOQQ's
  - 254 Counties
  - False color infrared
  - 1m resolution
  - June 1st to September 15th acquisition window (project divided into 4 areas with different dates per area)
  - Extended to November 21st.
- Idaho:
  - Complete statewide coverage
  - 6,522 DOQQ's
  - 44 Counties
  - Natural color
  - 1m resolution
  - June 1st to August 30th acquisition window
  - Start delayed 2 weeks due to late spring, extended to October 1st.
- Louisiana:
  - Partial statewide coverage
  - 1143 DOQQ's
  - 20 counties
  - Natural color
  - 2m resolution
  - June 25th to August 30th acquisition window
  - Extended to October 1st.

Project team:

- Team comprised of 3 companies (North West, EarthData, Horizons)
  - Technically NWG is the prime with EarthData and Horizons as sub-contractors but we all view this as a “team” effort
  - Leverage skills/capacity/R&D instead of duplicating efforts
  - This team has extended beyond NAIP on many other projects
- 4 Cessna Conquest propjet aircraft
  - High performance aircraft
  - Reliable proven performance for NAPP/NAIP projects
- 1 King Air 200 aircraft (Leased)
- Various twin engine piston aircraft
- 6 ADS40 sensors
  - 4 FCIR capable at start of season
  - 5 FCIR capable now
- 300+ combined staff
  - Maryland, South Dakota, Calgary (Canada)

Flight layout

- We fly NAIP production differently than film based acquisition
  - Line spacing is optimized to deliver 0.90m capture resolution
  - Line spacing for Texas was 5 minutes, Idaho was 6 minutes
  - This represents a savings of 33% and 60% respectively
- This is possible as the interference filters of the ADS40 are more tolerant of poor atmospheric conditions than film
- The comments that aircraft to fly above 24,000 feet are not common for NAIP is correct but:
  - ADS40 is almost 3X the cost of a film camera
  - Putting a expensive sensor in a aircraft that limits the sensors efficiency doesn't make sense
  - We are seeing 2 to 3 times the utilization out of our digital sensors over our film cameras
  - With better performing aircraft comes mobility to jump across the US to chase weather
  - Safety also becomes a factor
- As NAIP grows this is very important:
  - It's not possible to deploy 5+ aircraft in a typical state due to ATC traffic issues
  - With poor weather in SE states we need to get as much data per hour of flight-time as possible
  - This also helps with processing volumes

Processing infrastructure:

- Last year Leica GPro proved to have several weaknesses
- Working with Leica over the past 6 months many of these have been addressed (APM)
- Several custom processes were developed to address the remaining shortcomings in the workflow

Processing infrastructure:

- Processing capacity is a large concern with digital sensors:
  - Often the processing infrastructure equals or exceeds the sensor in terms of cost
  - Dedicated IT staff to keep the infrastructure operating
  - Data management is a very real issue
  - Off the shelf solutions not available
- Two sizable processing centers (IStar and Leica GPro):
  - IStar cluster:
    - Located at EarthData, Frederick Maryland
  - Leica GPro cluster:
    - Located at NWG, Calgary Alberta Canada
- Cross compatibility of the workflows helps leverage all processing resources

Pre-acquisition processing:

- Goal is to get as much of the ground work in place before data to process.
  - Picking control from USDA provided MDOQQ's
  - Preparing DEM into required format for processing infrastructure
  - Building shapefile indexes from USDA provided scan lists, county DOQQ lists, etc.
  - Adding processing resources based on contract award (disk capacity, backup capacity, Mr. Sid cartridge capacity)
- Due to very large contract awards this information was late in arrival
- We had data waiting to process but could not finalize due to a lack of control
- Prompt reference material delivery is important
- Delivery of CLU's would be a big benefit
  - Vector data means quicker delivery
  - Allows in depth QC by overlaying over new DOQQ's

Idaho data acquisition:

- Idaho data acquisition went smoothly but the weather patterns limited production greatly
- During good weather patterns up to 4 aircraft operating in Idaho
- Lost 1 week due to smoke issues
- Idaho acquisition 100% completed on September 27th
- Average 75 DOQQ's/day, in 2002 averaged 180 DOQQ's/day
- Over 7.5Tb of sensor data was collected

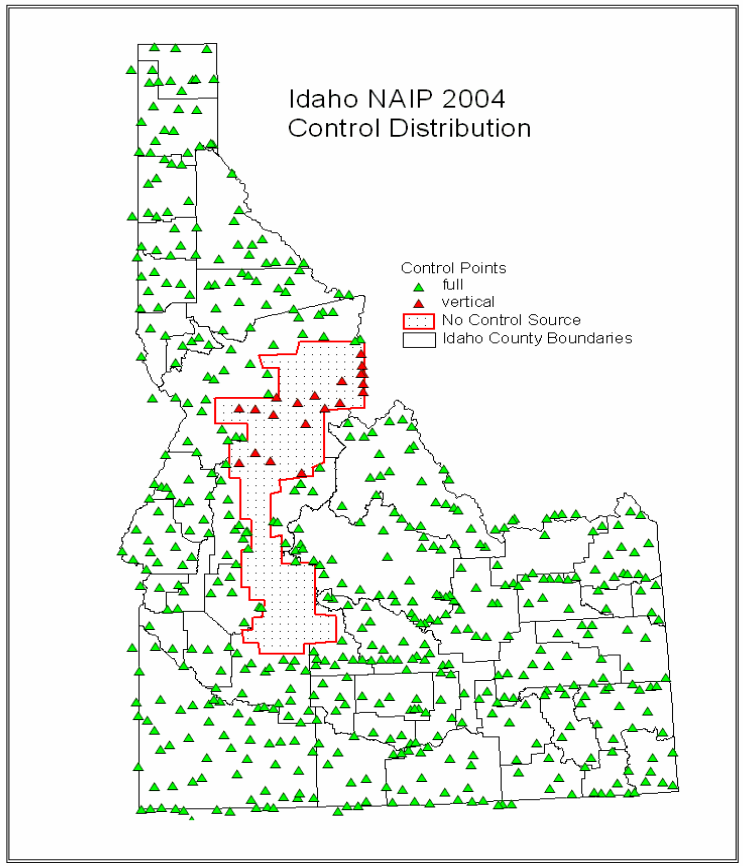
Idaho data processing:

- Idaho was divided into 38 sub-blocks for aerial triangulation and ortho production
- On average 6 to 8 blocks were processed per week
- The high relief terrain did slow this progress to 3 to 4 blocks due to DEM issues
  - DEM issues also hurt accuracy
- 100% Idaho processed
- Waiting on inspection to complete but preliminary results are promising

Idaho product accuracy:

- 600 check points were identified from the reference MDOQQ's provided
- These points are measured in the final DOQQ's to assess accuracy
- DEM was an issue in some high relief areas
- Break-lines compiled and DEM edit done to mitigate these problems

	X	Y
Max (m)	6.344	4.153
RMS (m)	2.152	2.071



Louisiana data acquisition:

- Louisiana data acquisition was difficult due to very poor weather in the south eastern US
- Record rainfalls and tropical storm activity
- Extensions granted until November 1st
- Averaged 82 DOQQ's/day
  - Largely due to standby in TX
- Louisiana acquisition 95% completed on October 30th
- 1.5Tb of sensor data was collected

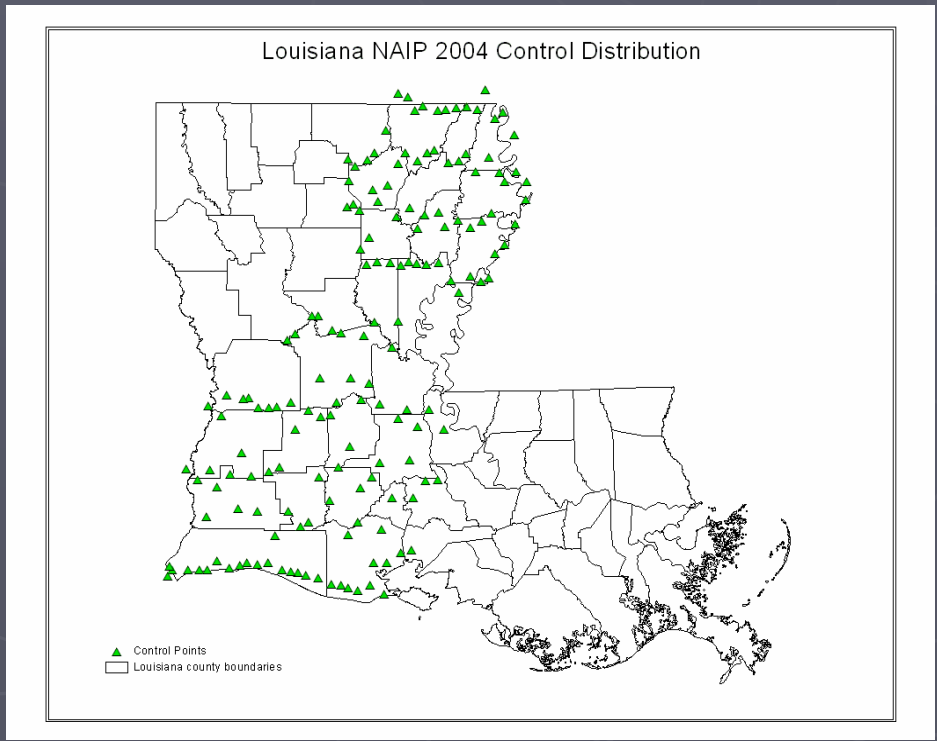
Louisiana data processing:

- Louisiana was divided into 7 sub-blocks for aerial triangulation and ortho production
- All blocks were processed in one week (flat is fast!)
- 1m product delivered to USDA instead of 2m product for no additional charge
- Louisiana processing 100% complete
- All deliverables to be submitted this week

Louisiana product accuracy:

- 121 check points were identified from the reference MDOQQ's provided
- These points are measured in the final DOQQ's to assess accuracy
- Results are similar to those achieved in 2004 Florida statewide USGS contract

	X	Y
Max (m)	2.734	2.237
RMS (m)	1.882	1.816



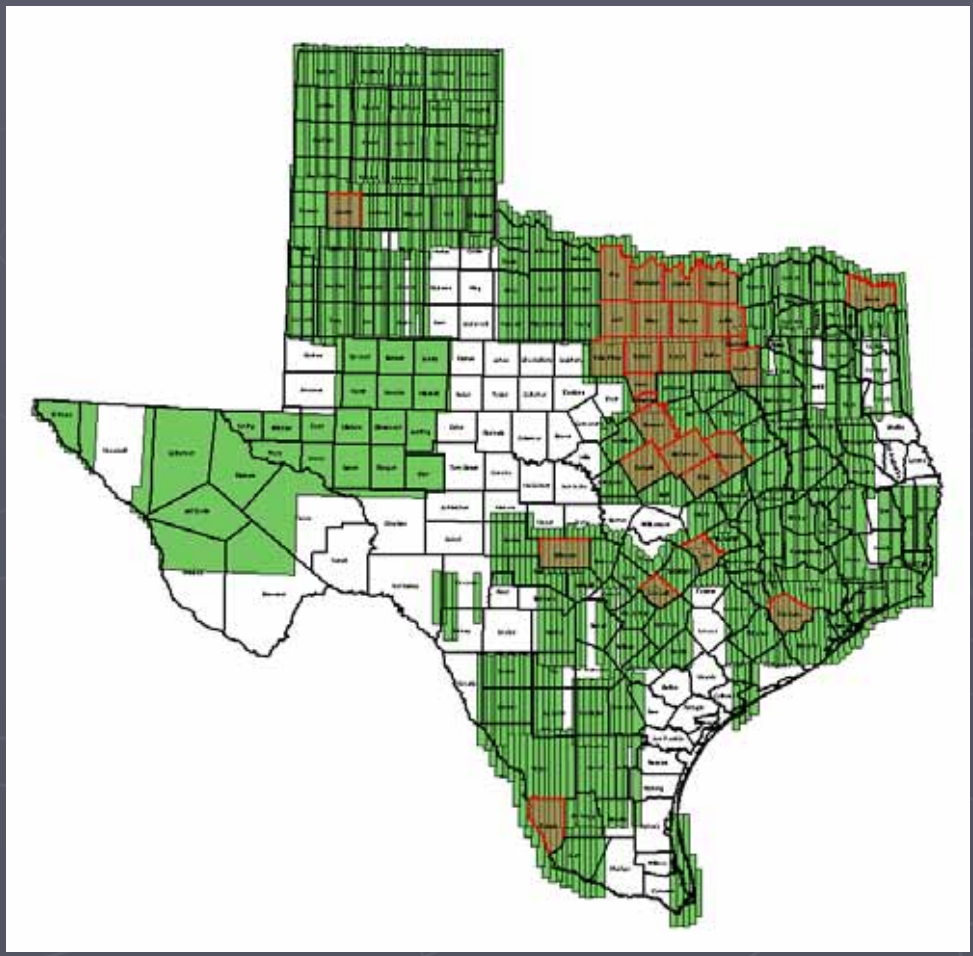
Texas data acquisition:

- Texas data acquisition was difficult due to very poor weather
- Record rainfalls in Texas this year
- Up to 5 aircraft operating based on weather patterns
- 2+ aircraft have been on location since June
- ~172 days on site, 26 flying days
- Some issues with ATC due to high traffic loads and airlines fighting for smooth air around storm systems
- Extensions granted until November 21st to complete acquisition
- Majority of the production (55%) has been accomplished since September 15th
  - This is after the original acquisition end date
- Texas acquisition 86% completed on November 15th
- Averaged 48 DOQQ's/day
- 18.1Tb of sensor data collected to date
- Comment yesterday by Kodak on flight acquisition needs clarification:
  - Oklahoma was a June 1st – 30th flight window.
  - NE Texas was a August 1st – 30th flight window.
  - Texas NE easily would have been completely flown if acquisition window opened June 1st like Oklahoma
  - Perhaps we need to talk to AGFA about our teams film requirements?

Texas data processing:

- Due to the late acquisition processing being done in parallel at EarthData and NWG to speed up delivery to USDA
- Texas is divided into 105 sub-blocks for aerial triangulation and ortho production to date
- On average 15 to 18 sub blocks are being processed per week when data available
- One bottleneck is that some sub blocks are only a few DOQQ's due to poor weather limiting acquisition to short missions

Texas processing status:



Texas product accuracy:

- To date internal accuracy analysis shows results similar to Louisiana
- External checks by State verifies these accuracies (Gordon Wells)
- Eventually over 6000 check points will be analyzed

Additional sales opportunities:

- Addition sale in Texas to the International Boundary and Water Commission:
  - This was for natural color 1m ortho
  - 699 ortho tiles in total
  - 393 from USDA NAIP contract, reprocessed
  - 306 additional tiles in Mexico added to the flight acquisition
  - New 5m DSM surface in Mexico created using the IStar correlation process
  - To be delivered after the USDA NAIP program acceptance

Sales opportunities (continued)

- Currently pursuing sales of several Texas counties re-processed to a natural color product
- Also opportunity of a Texas state-wide compressed format
  - ECW compression 18:1 due to some concerns over quality of 50:1 Mr. Sid product
- Pursuing interest in a re-processed false-color product in Idaho
  - Potentially statewide

Online sales!

- All data for Texas, Idaho, and Louisiana will be online for resale via our www.valtus.com online web portal after USDA approval
- Data in a JPEG-2000 lossless format
- Sales per DOQQ or custom cropped area via FTP download
- Subscription based service for direct use in any Arc 8.3 or later application (via web map services and ArcXML)
- www.valtus.com is a fully redundant spatial data web portal that is mission-critical to the top oil and gas companies
- Currently serving 1m ortho of Alberta and BC Canada:
  - 4000+ desktop subscriptions access this imagery via ESRI applications
  - 70,000 images a day
  - In operation since 2001
- Data cross sales agreements with several other spatial data portals
  - More sales channels the better as long as consistent pricing

Potential issue?

- RVSM becomes a issue in January 2005
  - Already in place in Canada since January 2004
  - No flights above 29,000 ft without upgraded avionics
  - This will push traffic down to below 29,000 ft
  - This will congest the airspace NAIP is typically flown
  - More ATC issues to deal with

Possible Improvements?

- The NAIP timeframe for Texas data acquisition (and the SE states in general) does not fit the traditional good weather season
  - Majority of production occurred after the NAIP original season ended (55%)
  - approximately 6 times that of Idaho
- Extensions are very welcome, but better understanding of absolute cutoff dates would help drastically

Improvements?

- Investigate other compression technologies worthwhile?
  - MG3, ECW, JPEG-2000?
- If MG3 or tile based for CCM's we can deliver much faster
  - Partial submissions and update later
- Other possible delivery formats?
  - Direct over web for preliminary CCM's?
- Advance notice over states to be flown would help to allow marketing efforts to find additional sales opportunities to help subsidize NAIP pricing
- Some reporting mechanism for areas with poor DEM to allow future updates

Our plans for next/future year:

- Work on improved automation of the workflow:
  - Ultimately want to transition to ‘lights out’ production with only human finishing, QA, QC
  - Pushbroom concept of ADS40 allows this level of automation
  - IStar is already ahead in this regard
- Increased processing capacity:
  - Handle additional ADS40 sensors
  - Better parallelization critical to this effort

Our plans (cont):

- More acquisition capacity
  - Planes, Sensors
- Focus on alternative products possible with the ADS40 to find other sale opportunities
- Exploit web sales as much as possible

Is film dead?

- Our first ADS40 turned 2 years old yesterday!
  - In these 2 years is has flown over 1000 hours of ‘on’ time
  - This is 2.5X greater than our average yearly usage of our RC30 cameras, when installed in the same aircraft servicing the same clients
  - This increase is purely due to more work, better efficiency, and extended flight times
- According to Leica the ADS40 is outselling the RC30
  - I believe Z/I would have a similar situation
- No significant R&D on film
  - Cameras, film processing equipment, or film emulsions
- This year ALL major projects have permitted digital sensors
  - Actually, a few very large projects have specifically not allowed film based solutions
- Ultimately it’s our clients that decide when film dies
  - Film is dying much quicker than we anticipated
  - We’re not happy, we own a full service lab (B&W, color, and FCIR)
  - Anyone want to buy a 1611 Versamat?

Questions?

- Thank you to the USDA-FSA allowing us the opportunity to present today

- Any questions?
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